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ABSTRACT

This is a retrospective account of the Del Mod System, a statewide project to improve science and mathematics education in the elementary and secondary schools of Delaware. The project functioned from 1970-76 under the auspices of a committee including the presidents of institutions of higher education, the state superintendent of public instruction, and a representative of the governor with grants from Du Pont and the National Science Foundation. The system was designed to identify and pursue statewide goals in a coordinated set of teacher training activities. A central feature of the system was a network of curriculum resource centers and educational field agents. This report is written as a case study to illustrate a number of themes--the weakness in current evaluation procedures when they are used as a basis for decision-making in complex educational programs; the potential, given special funding, of a statewide network of curriculum resource centers and educational field agents; the advantages and limitations of federal subsidies for statewide collaboration in school improvement; and the rapidly changing context of elementary and secondary schooling during the period 1970-76. (Author/IRT)

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DEL MOD: A STATE-WIDE SYSTEM FOR SCHOOL IMPROVEMENT

By Daniel C. Neale
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September 1977

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Acknowledgements

The author is especially conscious of the fact that this report takes liberally from the work of others. Not only are project reports quoted generously, but also the Del Mod System itself was the work of many people.

Acknowledgement is especially due Mrs. Charlotte Purnell, Director of the Del Mod System, who was a central figure in Del Mod from inception up to the present time. Her vision and her skill in the practical politics of educational collaboration made Del Mod possible.

Acknowledgement is also appropriate for all others who worked to make Del Mod succeed and to the National Science Foundation and the DuPont Company for financial support of the Del Mod System.

Daniel C. Neale

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DEL MOD: A STATE-WIDE SYSTEM FOR SCHOOL IMPROVEMENT

By DANIEL C. NEALE

UNIVERSITY OF DELAWARE

This is a retrospective account of the Del Mod System, a state-wide project to improve science and mathematics education in the elementary and secondary schools of Delaware. The project functioned from 1970-76 under the auspices of The Delaware Augmented Council of Presidents, whose members included the presidents of institutions of higher education, the State Superintendent of Public Instruction, and a representative of the Governor, with $2,800,000 in grants from the DuPont Company and The National Science Foundation. The system was designed to identify and pursue state-wide goals for improving science and mathematics education in a coordinated set of teacher training activities. A central feature of the system was a state-wide network of curriculum resource centers and educational field agents.

This report is written as a case study to illustrate a number of themes of general interest:

1. the weaknesses in current evaluation procedures when they are used as a basis for decision-making in complex educational programs such as the Del Mod System.
2. the potential, given special funding, of a state-wide network of curriculum resource centers and educational field agents.

3. the advantages and limitations of federal subsidies for state-wide collaboration in school improvement.
4. the rapidly changing context of elementary and secondary schooling during the period 1970-76.

The report begins with a description of the Del Mod System, followed by observations on each of the four themes. It should be emphasized that the views presented are the personal conclusions of a participating higher educator, using the benefit of hindsight. From 1971-1976 the author was Dean of the College of Education, University of Delaware, and deeply involved in the governance and administration of the System.

A Description of the Del Mod System

The Del Mod System is described at length in a variety of proposals, brochures, and reports, which are liberally quoted here to provide a summary description.

Background

An excellent summary of the origins of the Del Mod System has been provided by Charlotte H. Purnell, Director of Del Mod, in the Final Report.[1]

The seeds for evolvement of the Del Mod System appeared in 1968 in an unpublished paper by Uffelman and Purnell citing cooperative projects between the University of Delaware and the Department of Public Instruction. A subsequent study by Purnell in 1969 on The Status of Science Teaching in Delaware provided the needs assessment and background for later development.

Concurrent with these studies the Committee on Educational Aid of the DuPont Company embarked on a program to support secondary education and in particular to upgrade the extent and quality of science teaching in Delaware. Heretofore, DuPont financial aid in science had been limited to grants to institutions of higher education, specifically those which were heavily engaged in preparation of scientists and engineers.

In 1968, Delawareans elected Russell W. Peterson as their Governor. Governor Peterson had the distinction of holding a Ph.D. in Chemistry and had a life long interest in public education. He had served on numerous educational committees both in Delaware and nationally and was at the time of his election, a Director of Development for DuPont. It is coincidental that from past association the Executive Secretary of the DuPont Committee on Educational Aid and the State Science Supervisor were close personal friends of Governor Peterson. These relationships preceded Dr. Peterson's election as Governor and had considerable influence on the development of Del Mod.

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[1]Charlotte H. Purnell & John R. Bolig. A Description of Del Mod and Its Evaluation. Final Report. Vol. I. Dover, Del.: The Del Mod System, 1976, pp. 8-9.

The Delaware Technical and Community College was opened in 1967 as a two-year associate degree granting institution; thus, DTCC became the third institution of higher education to be supported by public tax funds. The University of Delaware (1832) and Delaware State College (1891) were already receiving an appropriation from the State Legislature. To foster cooperation, prevent overlap, and discuss common problems, the presidents of the institutions voluntarily formed the Council of Presidents (1968). This represented the formal beginning of overtly recognized cooperation among the institutions of higher education yet insured that each retained its autonomy and own governance.

Outside of Delaware other factors were developing which contributed favorably to the establishment of Del Mod. The National Science Foundation assumed new leadership under Dr. William McElroy. Under his leadership the Educational Directorate had begun a series of studies to determine the impact summer institutes, academic year institutes, inservice institutes, curriculum development projects and other activities were having on the science learning process in the schools. The results showed about 10 percent utilization of NSF sponsored curriculum projects and shot-gun preparation of teachers to use these projects. A decision was made to place large amounts of money in discrete areas as an experiment to determine if utilization of curriculum packages could be increased, student learning improved and the teachers better prepared to cope with the plethora of materials and methods on the market. A staff person was assigned the responsibility of implementing the idea.

Delaware - with its small geographic area, discrete population encompassing most segments of society, a science-education oriented Governor, close personal relationships between the principals involved, and an outside funding source for those aspects which could not be supported by NSF - was selected as a possible test site. A group was accordingly convened by the Governor to develop the proposal and the State Superintendent of Public Instruction was added to the Council of Presidents thus "augmenting" it - hence, the Augmented Council of Presidents (1970). Del Mod was funded and became an official project in July 1971. Over the years, Del Mod was to expend 2.8 million dollars.

Rationale

The following rationale for the Del Mod System was given in the proposal for the first year of operation.[2]

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[2] A Proposal for the Del Mod System--The Delaware Model; A Systems Approach to Science Education--to the National Science Foundation. February 24, 1971, pp. 15-16.

The Del Mod System for Science Education represents a system approach to the preservice and in-service phases of teacher education designed to improve the quality of science education in the elementary and secondary schools in Delaware. The concept of system employed in this model is that of a conscious attempt to utilize the strengths of each participating institution and agency in an integrative fashion to achieve a set of predetermined objectives. Each participating unit will develop components that will interrelate to reach the common objectives of the system. In the Del Mod System, assessment is continuous and components will be added, deleted, or revised in terms of goal facilitation. Major evaluation studies and goal assessment will occur at the close of the funding period. The Del Mod System represents an experimental approach to the improvement of science education in the elementary and secondary schools of Delaware. This approach is to be tested for a period of five years and, if successful, will serve as a model for curriculum improvement projects in other subject content areas. The cooperative, systematic approach to curriculum improvement involving all facets of education in the State, the business-industrial community, and national foundations appears to be an avenue through which significant assumptions can be tested relative to a total State commitment of educational improvement. If this approach proves to be successful, then similar improvement programs in all other curricular areas will follow.

The rationale for the Del Mod System for the improvement of science education has been developed in light of the following beliefs and assumptions:

A. Social change creates concomitant changes in the goals of society. Shifts in the core-values of a society necessitates changes in its system of and goals for education.

B. Knowledge in the areas of teaching and learning will increase in amount and specificity. The need for teachers to engage in on-going in-service learning experiences cannot be over-emphasized.

C. In a democratic society each child, youth, and adult must be guaranteed access to an educational system geared to his unique interests, needs, ability, and capacity.

D. Education functions to enable each child, youth, and adult to achieve his full potential as producer, consumer, and citizen in a democratic society.

E. Education in science should stress the concepts of inquiry and process rather than memorization.

F. Education in science must emphasize its potential for enhancing the life styles of man and the nature of the scientific enterprise.

G. Classroom teachers well grounded in the fundamentals of both the academic and pedagogical components of their profession tend to be perceived by students as interesting, meaningful, and enthusiastic.

H. Classroom teachers should be committed to a life of learning and reflect this commitment through a conscious effort to keep well informed relative to content, knowledge, teaching strategies, educational goals, and psychology as related to student development, behavior, and learning.

I. Experienced elementary and secondary classroom teachers can be utilized to enhance the pre-service education of prospective teachers and the in-service education of inexperienced or untrained teachers. The use of experienced teachers in this manner will greatly enhance articulation between the pre- and in-service components of the teacher training process.

J. The Del Mod System for Science Education can encourage change in phases of pre- and in-service education of teachers through a systematic and cooperative program of planning, classroom oriented research, assessment, development, and dissemination.

K. The consortium of institutions and agencies constituting the Del Mod System for Science Education will serve as a linkage between knowledge production, utilization, and evaluation through a cooperatively planned program of pre- and in-service teacher education.

L. The Del Mod System for the improvement of science education will test the hypothesis that a voluntary consortium of institutions and agencies can work together on programs of mutual benefit and concern without vying for power or sacrificing their autonomy.

Goals and Objectives

According to the initial proposal,[3] the goals and objectives of the Del Mod System were as follows:

The general goals of the model are:

A. To coordinate all segments of science education in the State so that a maximum impact can be made in reaching

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[3]Ibid. pp. 34-37.

all students from pre-elementary through the doctoral level. Science education is defined in the Del Mod System as all University activities and experiences in science and mathematics designed for the specific purpose of preparing a science or mathematics education teacher at the pre-service and/or in-service level.

B. To improve the extent and quality of science teaching at the pre-elementary, elementary, secondary, and college levels of the State which will result in students who are better educated and have a greater interest in science.

C. To provide a favorable climate for research and development activities in science and education.

The specific objectives of the Del Mod System are:

1. Given the proper data, monitoring system, and feedback mechanism, change in science education as reflected through changes in teacher attitudes, pre-service and in-service preparation programs, student attitudes, and student achievement will be demonstrated over a five-year period as a result of research, cooperative planning, pilot projects, and pre-service and in-service training.

2. Provided with a cadre of trained science leaders individual schools, districts, or regions will improve teacher competence, emphasizing an interdisciplinary mix through continuing education programs. The nature and type of these programs will be determined by analysis of present status of science education.

3. Given a group of science education leaders and sources of science education materials, individual schools will develop integrated science curricula with a built-in system for formative and summative evaluation.

4. The schools will incorporate into their on-going programs newly developed science curricula or modifications thereof given the proper training, both pre-service and in-service, and the sources from which to select materials.

5. Curriculum materials and instructional strategies will be developed, tested, and disseminated in the emergent areas of population environment studies and marine environment studies for classroom teachers K-12.

6. With the proper programs, leadership, and resources, teachers will develop, try-out, evaluate, and modify programs, materials, and strategies for varying student ability levels within their classroom for an individualized approach to science education.

7. Science teachers will demonstrate the relationship between mathematics and science in their classroom presentations by incorporating mathematical functions into daily classroom practices. Conversely mathematics teachers will demonstrate the relationship of mathematics to science by using the process approach to mathematics in their classrooms given the leadership and dissemination techniques to encompass the language and methods common to both.

8. Given the appropriate training a group of educational technicians will demonstrate their contribution to an instructional team under the supervision of certified teachers.

Structure and Funding

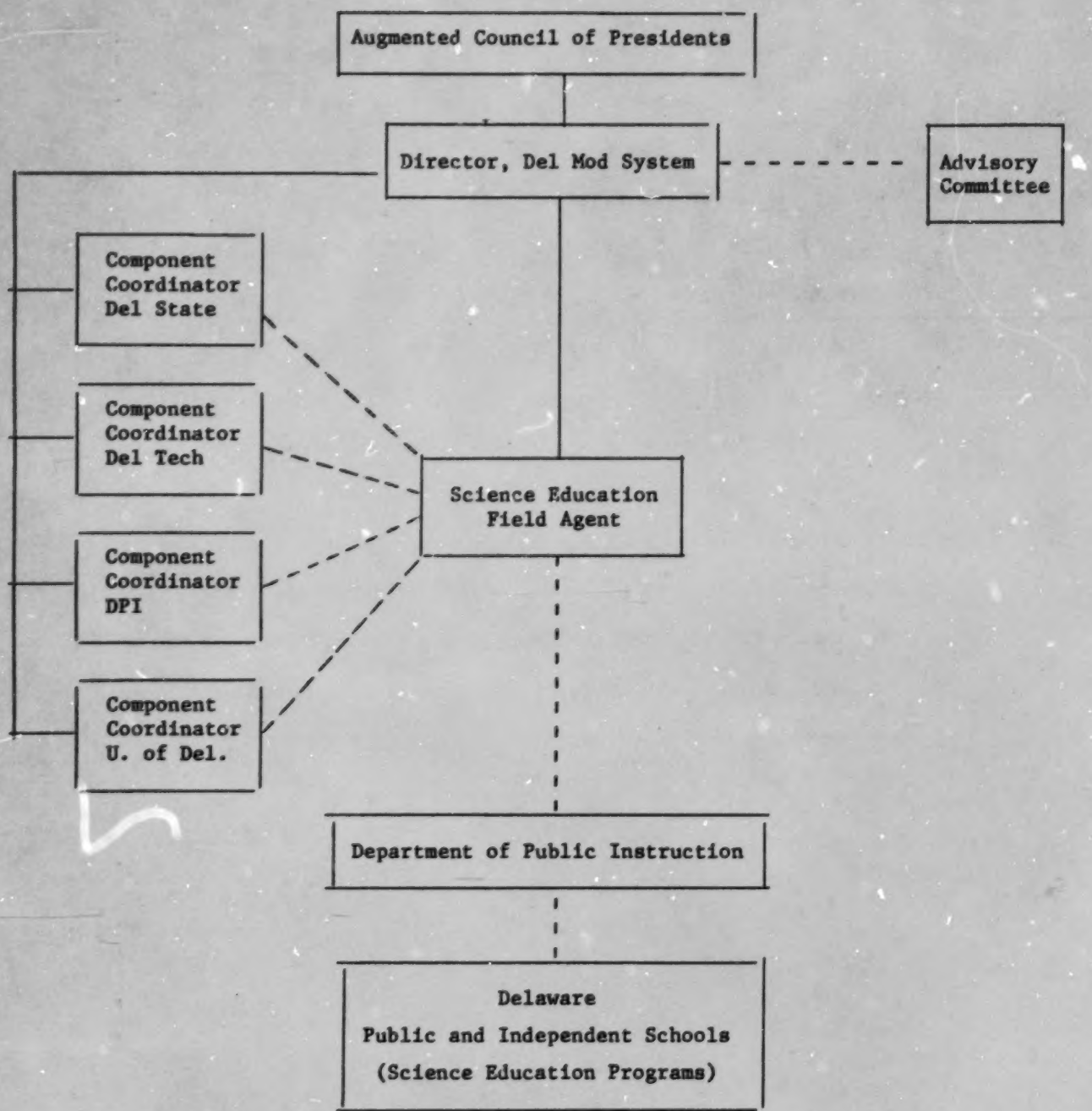
The basic organization of the Del Mod System is given in Figure 1. The Augmented Council of Presidents (the presidents of the three institutions of higher education, "augmented" by the State Superintendent of Schools) acted as the governing body and recipient of grant funds. During the early years of the System the Director reported directly to the Council of Presidents, later through a Coordinating Council for Teacher Education, whose members were appointed by the participating institutions.

At each institution a Component Coordinator was responsible for Del Mod activities, both to institutional authorities and to the Director of Del Mod. The Director met regularly with Component Coordinators as a group to provide System-wide coordination.

In addition, a staff of educational field agents, responsible to the Director, provided services directly to School personnel, while maintaining liaison with participating institutions through Component Coordinators. During the last two years of Del Mod supervision of the field agents was shifted to the Component Coordinator at the University of Delaware as a part of the effort to phase Del Mod programs into the participating institutions.

Figure 1

Administrative Structure of the Del Mod System



As indicated in Tables 1 and 2, a total of $2,857,077 was allocated through the Del Mod System. Table 1 shows that the primary sources of funding were NSF ($2,189,392) and DuPont ($626,985), with small amounts coming from the Hercules Company, the Crystal Trust and the State of Delaware. The largest allocations were made through the University of Delaware ($1,066,795) and the Director's Office ($916,165) with the remainder distributed evenly among the other participating institutions.

Table 2 shows the distribution of grants by year, beginning with preparation activities in 1970-71 ($85,175), building to a peak in 1972-73 ($721,512), and phasing down to the final year, 1975-76 ($395,384).

A major premise of the funding, which is reflected in the allocations, was that special funds would be phased-out in expectation that regular institutional or state funds would pick up the activities. This did not occur in any direct sense for the Del Mod System itself. However, many activities supported by Del Mod do continue within the participating institutions and in a variety of collaborative projects.

TABLE 1

DEL MOD FUNDS BY SOURCE AND COMPONENT

1970-1976

	NSF	DuPont	Hercules	Crystal	State
U of Del	$ 754,720	$312.075	$	$	$
Del State*	292,142	26,000			
Del Tech	260,739				
DPI	182,100	72,450			35,000
Del Mod Office	694,005	216,460	3,000	2,700	
TOTALS	$ 2,189,392	$626,985	$3,000	$2,700	$35,000

TOTAL ALLOCATED: $2,857,077

* In 1971-1972 NSF also granted $30,670 to Del State for the UPSTEP program.

TABLE 2

DEL MOD FUNDS BY SOURCE AND YEAR

	NSF	DuPont	Hercules	Crystal	State
1970-71	$ 24,500	$ 60,675	$	$	$
1971-72	390,812	163,275		2,700	
1972-73	591,162	129,350	1,000		
1973-74	482,352	112,135	1,000		
1974-75	400,182	86,550	1,000		15,000
1975-76	300,384	75,000			20,000
TOTALS	$2,189,392	$626,985	$3,000	$2,700	$35,000

TOTAL ALLOCATED: $2,857,077

Activities

Because the Del Mod System was designed to coordinate science and mathematics curriculum improvement activities on a state-wide basis over a number of years, a simple description of Del Mod activities is impossible. In fact, the Del Mod presence in Delaware was so pervasive during these years that few, if any, efforts to improve science and mathematics education were not affected by the Del Mod System in some way. Because key educational leaders, such as the State Science Supervisor, for example, were deeply involved in the Del Mod System, the full range of their activity was in a sense, Del Mod activity.

Considering only those activities receiving direct support from Del Mod funds, as shown in Table 3, adminstrative activities accounted for 18 per cent and evaluation activities for almost 5 per cent of the total budget allocations. The remaining program activities, which comprised approximately 77 per cent of the expenditures, may be divided into three categories: 1) the field agent program, 2) the resource centers, 3) other programs.

The Field Agent Program. A central strategy of the Del Mod System was the development of an educational field agent program. Field agents were experienced classroom teacher-leaders, who provided direct service to teachers, and provided liaison between classroom teachers and other elements in the Del Mod System. Field agents worked with teachers as individuals and in groups to encourage the use

TABLE 3

DEL MOD FUNDS BY
FUNCTION, 1970-1976

Function	Amount	Per cent
Administration	$ 524,870	18.3
Evaluation	138,579	4.8
Field Agent Program	357,842	12.5
Reosurce Centers	419,374	14.6
Other Programs	1,434.412	49.9

of teaching methods appropriate to the newer curriculum materials and to act as a resource to help solve teacher problems. Field agents were to provide linkage between teacher needs and problems and the resource centers, in-service courses, and other educational programs offered throughout the state.

On the basis of an analysis of Field Agent Projects, Golts[4] found the major emphasis of field agent activities to be related to curriculum planning and teaching strategies. Little emphasis was given to research, to subject matter knowledge, or to the creation of teaching materials. Typically, field agents worked in a sustained fashion with individuals or small groups of teachers, with particular emphasis upon the middle school grades. The primary emphasis was upon science, although attention to mathematics was added after 1973.

According to Golts, the Field Agent Program was the most favorably received aspect of the Del Mod System. Particularly among teacher clients, the field agents' work was warmly received and applauded.

Del Mod Resource Centers. Another special feature of the Del Mod System was the establishment of three curriculum resource centers throughout the state. The resource centers at the University of Delaware, Delaware State College, and Delaware Technical and Community College at Georgetown, housed a variety of science and mathematics curriculum materials which were made available to the clients of the Del Mod System, especially in-service teachers.

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[4]Uldis R. Golts. A Descriptive Analysis of the Del Mod System's Field Agent Component. Final Report Vol. 3. Dover, Delaware: Del Mod System. July, 1976.

Resource Centers were conceived as an important backup to the field agents, who could use facilities and materials in work with in-service teachers.

As resource centers developed, each took on special characteristics. As documented by Richardson,[5] the University of Delaware Resource Center emphasized service to undergraduate and graduate teacher education programs. The Delaware State College Resource Center served best the needs of undergraduate teacher education students. At Delaware Technical and Community College the Resource Center emphasized service to in-service teachers, especially those working with field agents in non-credit programs. The latter resource center was viewed by many as the "very model of a Del Mod Resource Center". In so far as the Del Mod System is viewed as a system for providing direct service to classroom teachers, the Del Tech Resource Center is, indeed, a successful example. On the other hand, if the Del Mod System is viewed as an effort to improve science and mathematics education generally, one can appreciate the contributions made by resource centers at Delaware State College and the University of Delaware through undergraduate and graduate education. It appears, however, that such an emphasis works against service to individual teachers on an informal basis.

Other Del Mod Activities. As indicated in Table 3, almost one half of Del Mod funds were related to activities other than

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[5]Sarah Richardson. The Evolution of the Del Mod System's Science and Mathematics Resource Centers, 1971-76. Final Report. Vol. 2. Dover, Delaware: The Del Mod System. May, 1976.

field agents and resource centers. In retrospect, a bewildering array of diverse activities was subsumed under the Del Mod umbrella. These activities might include a casual visit by a field agent with an individual teacher, single teachers working alone on a classroom project, local district projects with groups of teachers working together, the development of an undergraduate science education major, graduate courses and summer institutes and even state-wide in-service days serving over 1,000 teachers. As indicated in Table 4, from 1970-75 Del Mod sponsored 213 different projects serving a total of 7,329 participants. These projects were distributed among the components as indicated in Table 4. Field agents accounted for 81 projects involving 1,612 participants, mostly working as individuals or in small groups. The Department of Public Instruction, with 14 projects involving 2,964 participants, included several very large meetings and in-service programs. Local districts had 38 projects involving 648 total participants. Individual teacher projects were relatively few in number (17), involving only 76 participants. The 54 projects sponsored by the University of Delaware were primarly courses and workshops offered for graduate credit. These reached 1,912 participants for a total of almost 85,000 participant hours. Delaware State and Delaware Technical and Community College accounted for only nine projects involving 117 participants. Del Mod supported the development of an undergraduate science education major at Delaware State College, and, as mentioned, resource centers were important activities at each of these two institutions.

TABLE 4

PARTICIPATION IN DEL MOD PROJECTS,
1970-75

Component	No. Projects	Participants	Av. No. Participants/Project
Field Agent	81	1612	20
Dept. Public Inst.	14	2964	212
Local District	38	648	17
Ind. Teacher	17	76	4
Univ. Del.	54	1912	35
Del State	7	108	15
Del. Tech	2	9	5
All Components	213	7329	34

Evaluation Procedures.

Evaluation activities in the Del Mod System were a constant source of controversy. In the Del Mod proposal for 1971-72, evaluation plans are sketchy, specifying only that a status study of science and mathematics education would be made at the beginning of the project and five years later. It was also assumed that each Del Mod project would contain procedures for its own evaluation. Staff members of the Del Mod System, including the Research Director, held to this view of evaluation despite a variety of criticisms and suggestions from funding sources. I think it fair to say that the Del Mod System, as originally conceived, placed great emphasis upon the development of a system for delivering school services with little attention given to rigorous evaluation. Subsequently, NSF personnel and priorities changed, and evaluation within the system and of the system itself became increasingly important. In 1973, discussions with Foundation officials led to a plan to augment evaluation activities of the Del Mod System. Eventually, a contract was let by the Foundation to The Evaluation Center, Western Michigan University. The evaluation, which included site visits by a panel of experts, was conducted during Spring 1974, under the direction of Dr. Daniel L. Stufflebeam. Del Mod staff members were critical of these evaluation procedures and results, especially those which pointed out weaknesses of evaluation procedures within the System itself. Subsequently, consultations with Research for Better Schools led to a final evaluation plan to supplement the pre-post design with a "responsive evaluation", which included reports from a variety of first-hand visitors, each of whom was nominated by a key figure from within the Del Mod System.

Results of the evaluation activities are disappointing, because limited as they were in conception, they were even more limited in execution. Thus, the status study of mathematics and science education in Delaware, planned for the end of the project, was almost totally vitiated by sampling blunders and data collection problems. Systematic evaluation of individual Del Mod projects was largely absent, although careful descriptions were made of each project. Other evaluation activities consisted of the opinions of participants or of "connoisseurs" that observed portions of the Del Mod System for short periods of time. Although such opinions are subject to a variety of biases, they form the principal basis for summative evaluations of the Del Mod System, and are, therefore, quoted at some length.

The Stufflebeam Evaluation Results

The results of a brief, but intensive, evaluation of the Del Mod System by the Evaluation Center, Western Michigan University, were summarized as follows:[6]

> Del Mod was described by some members of the evaluation study as a social system, more than an engineering system, which is highly responsive to service requests from the field. The mix of funding sources available to Del Mod (private and federal) was seen as advantageous. Funding from various sources provided the system with the flexibility it needed to respond to various requests. Constraints put upon the use of money by one funding source are different from the guidelines offered by other sources. Thus, Del Mod is able to

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[6]Daniel L. Stufflebeam. Del Mod System and Science Education. A Report Presented to the National Science Foundation. Project No. GW 7903, June, 1974.

respond to a variety of requests in a variety of ways because of the multiple-funding sources. However, because no common set of objectives are specified system wide, the effects are dependent upon the person making the response. Other effects at the state level were not found because of a lack of documentation at the state level. However, several effects were isolated in terms of the sub-system elements of Del Mod.

System Elements

Besides the study of the entire system, six elements of the Del Mod System were selected for study: 1) college projects, 2) resource centers, 3) field agents, 4) local district projects, 5) individual teacher projects, and 6) internal evaluation. Each of the phases of the study was designed to gather information about these elements. The following section presents a brief summary of each element and some recommendations made by the panel members with respect to each element. The recommendations in this section address one of the major purposes of the evaluation study, i.e., information which will be useful to the internal project staff.

College projects

The college projects are described, on the whole, as not too different from the old NSF funding pattern. Generally, the college projects were found to represent typical courses taught in a university setting. These projects in some respects have been successful in that they have changed the preservice curricula in several post-secondary institutions. New courses have been institutionalized as a regular part of teacher-training programs. Some new positions have been created in the colleges of education. The college projects have also led to the involvement of faculty from science and mathematics in the teacher preparation curricula. This involvement has led to some conflict for these individuals. In some cases their involvement with the college of education has produced negative reaction from their own departments.

In most instances reciprocity from the schools or other agency was not demanded before funding was granted; hence, some of the projects were found to exist solely because of the outside funds and would be phased out as soon as the outside funding was terminated. These courses which will be phased out are not, however, integral parts of the training programs in the institutions. In most cases they represent courses which were offered as part of in-service programs which are not necessarily integrated into the preservice curricula.

The goals of the college projects have a wide scope. There is no common set of objectives which all college projects address. The design of the projects for the most part can be described as typical

college courses. No formal data were available for evaluation of the results of these projects. An informal communication network was used in the project to evaluate these projects.

Resource Centers

All data-collection phases of this study showed high satisfaction on the part of teachers with the Del Mod resource centers. Each of the three centers in Delaware is slightly different in terms of goals and designs. The Delaware State Center was just opening during the study and no clear evaluation of that center took place. The center at Delaware Technical and Community College at Georgetown serves teachers exclusively. This center publishes a newsletter which has wide distribution to teachers in the state and maintains an idea file which the clients find useful. The center is stocked with exclusively science and mathematics material. This center was singled out as the best organized and most accessible resource center which was studied.

The center on the University of Delaware campus serves a different population. This center defines as its clients both teachers and students. Also, other materials are kept in the resource center. Science and mathematics materials account for approximately one-fourth of the materials in the UD Center. The UD Center receives funding from other sources for the other curricular area materials which it stocks.

There is a high probability that the resource centers represent an element of Del Mod which is both institutionalizable and transportable. All three of the centers will probably continue at the sites when the "soft money" is discontinued. However, the exact form of the center, when supported by local monies, is unknown.

The goals of the resource center element of Del Mod vary across centers. However, the designs of the centers also vary to achieve the specific goals in each location. Some data concerning use of the resource center facilities were available for review by the study team. However, no common record-keeping procedure is used at all three centers.

Two additional comments were generally made about the resource centers. First, no systematic evaluation of the materials in the resource centers occurs either at the acquisition stage for center materials or later when materials are presented to teachers. Although the initial list of core materials was developed with evaluation dimensions in mind, acquisition currently are made on the basis of what is available. When teachers are presented with materials in the center, no effort is made to judge the quality of the materials. Rather, the materials are available for evaluation

by the teachers. In some cases, the field agents have input into the acquisition decisions, while in other cases the agent is not a significant factor in the acquisition decision. Since a field agent is located in each resource center, most members of the study felt that systematic, formal communication lines should be instituted. Second, no planned communication takes place among the three centers. Systematic communication between Del State's Center and the other two resource centers is seen as particularly desirable, since Del State's Center is just now getting underway. Depending upon the specific nature of the goals of the Del State Center one or both of the other centers could be extremely helpful in its development.

Field agents

All three phases of the study found that the Del Mod field agents were positively received in the state. This element was also seen as a candidate for institutionalization and transportability. In fact, it was pointed out that this role has already been defined in the literature under several titles--notably the change agent.

In Del Mod, no one definition seems to be applicable to the operating style of the field agents other than the personal characteristics of the agents who presently are role encumbents. The agents have received no specific training for their roles in Delaware and each agent tends to have his/her own style of action. For instance, some agents often demonstrate teaching strategies while other agents refrain from teaching. The method used by a majority of the agents to secure involvement of school people seems to rest upon merely waiting for a request for help. This outreach method probably means that large numbers of the people with whom the agents have contact are actively concerned about science and math, while the people who most need their help may be missed. Although the field agents appear to be a success in the state, there is no clear plan for the institutionalization of the role of field agent in Delaware. Such institutionalization is, however, being studied; various plans concerning regular staff positions for field agents in the universities or the school districts are now under consideration.

Several recommendations were made concerning the field agent role. Detailed descriptions and recommendations are contained in chapters by Guba and Stufflebeam. The number of field agents should be increased. Each field agent should document the process which he/she uses with a teacher. The individual agents should be trained specifically for their work as change agents in the schools. Also, materials should be developed for their use--materials which could enhance their role in the schools.

Local district projects

The segment of Del Mod involving local district projects is to be phased out. It is the contention of several of the Del Mod staff that this component did not work well, but no clear evidence exists among the collected evaluative data to show these projects different than other projects funded through Del Mod. However, there are indications that some of the local district projects did not succeed in accomplishing their objectives because teachers were not involved in the proposal writing. Field agents in some cases were often assigned to work with groups of teachers in a proposed local project only to find that the teachers had no interest in the project. Teachers seem to have made no greater use of published materials in these districts even though such materials were available readily. Nor was there any evidence of improvement in articulation between grade levels. A few of the review panelists suggested that one of the conditions of receiving funds for local district projects should have been a show of commitment on the part of the local district. Such commitment could have been evidenced by some sharing of the cost of the operation of the project or a definite plan for institutionalizing the project after the time when Del Mod money would be withdrawn.

Individual teacher projects

There are only a few individuals involved in the individual teacher projects of Del Mod to date. Those involved in this component see high benefit from it. Several members of the evaluation study commented upon the good will created in the field by these projects for Del Mod. These projects are a low-cost item in the overall budget of the system. But it has high visibility. Teachers in the state are aware that money is available for the pursuit of individual projects and that Del Mod is open to requests from the field. No follow-up procedure is used to see if the developments of the individual teacher projects are used and no check is made on the quality of the effort.

Evaluation

There is a general lack of documentation in the Del Mod system. All three phases of the evaluation study experienced difficulty in gathering data. The difficulties fall into two broad categories: 1) difficulty in securing the plan for the evaluation, and 2) difficulty in securing the documents which were evidence of evaluation activities. Although some internal evaluation may be going on at the component and project level, no formal effort is made to document at the system level. Detailed recommendations concerning evaluation may be found in the chapters by Stufflebeam and Guba. The review panelists suggested that an effort be made

to reconceptualize evaluation. They recommended that Del Mod design internal evaluation which would serve decision making and accountability, and that the Del Mod project proceed to implement the design. Guba also suggested that monies should be budgeted for an auditor and consultant to aid in the redesign and to check on the implementation.

Summary

On the whole, the review panel found that their general perception of the Del Mod system was positive because of the high level of teacher satisfaction. They perceived the system as a service organization for teachers and not as an engineering system. The findings are generally qualified by two statements: First, they saw only a sample of people involved in the system--not a random sample of teachers in the state nor could any one panel member see the entire scope of the system. Second, the lack of internal evaluation provided them little information with which to supplement the data they had collected first hand.

Results of the Responsive Evaluation

Another systematic effort to collect opinions was the responsive evaluation, which produced findings very similar to those of the Stufflebeam evaluation. The responsive evaluation was conducted during 1975-76 by Dr. John Bolig, Del Mod Research Director, and summarized by Dr. Donald W. Humphreys, a science educator from Temple University, as follows:[7]

Introduction There is little question about the importance of program evaluation, but there is some disagreement among evaluators as to what constitutes valid evaluation. The statistical models of evaluation have provided researchers and evaluators with some degree of satisfaction as to whether an experimental activity or a change in the teaching mode have caused a change in pupil achievement or not. The numerical assessment provides a concreteness to the research not available from other evaluation models. The danger inherent in some statistical assess-

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[7]Donald W. Humphreys, Kenneth Dowling, and John R. Bolig. The Del Mod System: An External Evaluation. Final Report. Vol. IV. Dover, Del.: The Del Mod System, June, 1976, pp. 6-15.

ments is in stressing numerical precision where numerical precision is unwarranted. It also is evident that descriptive evaluations may allow evaluators to express different weights of importance of components of a program. Conversely, the descriptive evaluation lacks numerical precision. It is the state of the art which should determine whether a statistical or a descriptive evaluation model should be used.

Several of the seventeen evaluators of the Del Mod Project expressed concern about the method of evaluation used. These evaluators felt that a precise numerical evaluation should have been used. For the final evaluation of Del Mod, both descriptive and statistical evaluation have been used. This report is a summary of the descriptive evaluation of the Del Mod System. If compiled properly, the combination of statistical and descriptive evaluation should provide a relatively complete assay of the Del Mod System activities.

The Evaluation Team The evaluation team members were asked to participate in the evaluation by the Delaware Department of Public Instruction, The University of Delaware, or the Del Mod System. Two evaluators usually evaluated Del Mod on the same dates, but each operated independently, following a flexible pre-determined schedule. No attempt was made to invite the evaluators on the same dates, but pairings often resulted coincidentally when the Del Mod staff schedules were matched to the schedule of each evaluator. To be certain that the desired components were evaluated, each evaluator was asked to emphasize either the Del Mod administration, resource centers, field agents, or evaluation as the evaluation task. In all cases the evaluators were asked to determine the transportability of any or all of the Del Mod components. Each evaluator had contact with the resource centers, Del Mod administration, Del Mod evaluation staff, and field agents during the two day evaluation period.

The Responsive Evaluation of the Del Mod System The Del System has been in operation since 1970. Sponsored by the National Science Foundation and assisted by the DuPont Company and the State of Delaware, the Del Mod System was designed to provide the science and mathematics teachers of Delaware with direct assistance through curriculum workshops, field agent and resource center assistance, and solution to individual teacher classroom problems. The Project will have completed its obligation to the National Science Foundation in July, 1976; and if parts of the project are to continue, funds must be provided through other sources.

This report will summarize the findings of the invited evaluators under the headings of (1) Del Mod System Administration, (2) Mathematics and Science Field Agents, (3) Science and Mathematics Resource Centers, (4) Equipment Repair Center, and (5) Evaluation Staff.

Del Mod System Administration The administrative structure of the Del Mod System is unusual in its governance by representatives from the University of Delaware, Delaware State College, Delaware Technical and Community College, the State Department of Public Instruction, and the Del Mod System. A Council of Presidents was composed of the chief officers from each of the institutions listed above. The Council of Presidents delegated fiscal authority to a Council of Deans but retained the policy making function. The director of the Del Mod System retained major responsibility for fiscal management and the implementation of policy and program.

It was evident that a policy existed to disseminate as much of the funding as possible directly to the Delaware teachers. An estimated 78% was spent on teacher workshops, special teacher projects, the resource materials, and classroom assistance through the field agents.

Little feedback from Delaware teachers was available to evaluate the administration of Del Mod. Teachers had little direct contact with the Del Mod administrators and were generally unaware of the administrative structure. Based upon the general teacher satisfaction with the Del Mod System, it can be assumed that administrative structure was adequate and worked well.

Different evaluators noted the excellent liaison between the Department of Public Instruction, Del Mod, the University of Delaware, Delaware State College, and Delaware Technical and Community College. One evaluator perceived a desire by administrators of the institutions of higher learning to upgrade science education in the State of Delaware. Evaluators also perceived the support of the field agents by the Del Mod administrators.

One evaluator noted that the administrative model was flexible enough to meet the needs of participants in the program and that the funding of the program was administered well.

Evaluators involved in evaluating the Del Mod Administration generally were highly favorable to the administrative function and structure, but felt that the administrative model would not adapt itself well to other states developing similar programs. To say the administrative model of the Del Mod System is not transportable to other states does not imply that the administration of Del Mod was ineffective. The relatively small area served by Del Mod when compared to the area of most other states, and the number and location of institutions of higher learning in other states would probably dictate the structuring of a different administrative model.

Field Agents Of the several components of the Del Mod System, teachers have viewed the field agents as the most important facet to them. This result is not surprising since the field agents were envisioned originally as the direct link between the Del Mod goals and the teachers.

The field agents were well suited for their positions. Each was required to have earned a baccalaureate in science and a master degree in science education, and to have completed five years of successful classroom teaching in grades 5-9. Each brought to Del Mod a unique set of experiences and skills which were augmented by attendance at national meetings and workshops designed to promote understanding of the rationale of new science curricula.

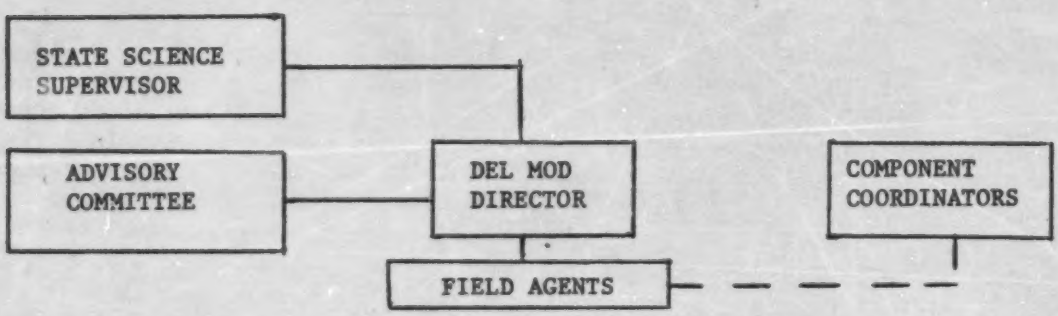
Several goals have been built into the field agent component of the Del Mod System. They are listed as follows:

(1) Establish liaison between the institutions of higher education, research centers, curriculum projects, state agencies, and the classroom teacher within designed levels and geographic areas.

(2) Construct, adapt or utilize any techniques needed to improve teacher competencies.

(3) Conduct a wide variety of inservice activities designed to meet the needs of science teachers as determined by baseline data, conferences with local supervisors, the state science supervisor, teachers and others.

(4) Disseminate information about and serve as implementors for materials and methods developed by curriculum projects of the Del Mod System and other institutions.



Field Agent Relationships
Figure 1

The Director of Del Mod was responsible for supervision of the fiscal and policy operations of the field agents until fiscal year 1974-1975 when the component coordinators assumed this function. This change was part of a planned change in adminis-

trative structure after NSF funding stopped. An advisory committee reviewed the program, while the component coordinators and the state science supervisor provided some direct input for special curriculum projects.

Each field agent worked out of a resource center and had available the latest science and math teaching materials for Delaware teacher use.

The original operational philosophy for the field agents was followed closely by the field agents; from the feedback provided to the evaluation team, this guide to field agents was instrumental to the high degree of success for the field agent compone of Del Mod. The philosophy statement ends with the sentence: "It is construed to involve liaison between all segments of the industrial, scientific, educational communities, and classroom teachers in a non-threatening manner." The most frequently made statement to the evaluation team by teachers was that they could speak freely about classroom problems without fear of being poorly evaluated by a supervisor. They could honestly seek help with classroom problems which could lead to improved science and math teaching.

All evaluators evaluating the field agent component of Del Mod stated that this was the most important part of the system. Schools using the services of field agents have become dependent upon the use of their services and would like the program continued. This dependence in part may be due to the fact that many services provided had previously been unavailable to the schools.

Several evaluators found that new curricula were introduced to teachers by the field agents, or that teachers were stimulated to investigate existing curricula, or encouraged to develop a unique curriculum for their school. In addition to the curricula developments, teachers were encouraged to develop individual projects involving new instructional technique, development of equipment, and other classroom innovative practices.

The field agents were lauded for their ability to sense teacher needs and to provide inservice programs for each need. Evaluators differed on the effectiveness of these programs. Two evaluators felt that more effort should have been put into long-range planning while others felt that the curricula developed did represent long-range planning. It appears from the evaluator reports that field agents were most interested in the immediate needs of the teachers. The teachers were most interested in the solution of immediate problems and took only secondary interest in long term goals. The long-term planning was probably incidental to the more pressing immediate problems. It is apparent, however, that long-term planning is generally built into most curriculum projects.

The field agents were able to provide teachers with concrete examples of many instructional and curricular innovations since these materials were readily available in the three resource centers. None of the evaluators questioned the value of the centers to the schools, but many felt that the most import aspects of the field agents' work did not involve the resource centers, and that if no resource centers were available, the field agents could still operate successfully.

Several evaluators like the flexibility of the individual field agents. Each was apparently able to provide assistance in a wide variety of problem situations. One evaluator noted that the field agents were most effective when teachers asked them to perform specific tasks, or to solve specific problems.

The evaluators rated the field agent concept as transportable to other states. Several different variations were suggested for implementation into different geographical areas. One evaluator suggested that two field agents could work out of each community college. Several evaluators pointed out that since universities and 4-year colleges have a somewhat different staff advancement structure than does the community college or other agencies, that the strong service aspect of the field agents' position would best be administered by the community college or a service-oriented agency. Another evaluator suggested that the field agents could work out of the various state departments of public instruction. Units similar to the intermediate units of Iowa and Michigan were suggested as a third alternative to a field agent program. The fourth alternative would have a single field agent hired by several school districts, with the agent's time spent in any one district being determined by the percentage of his salary paid by that district.

Several evaluators would like to see minimal secretarial help provided for the field agents. This would enable them to maintain a schedule and to have appointments phone in from the schools.

The teacher reaction to the field agent component of Del Mod was highly positive. Since it is the most visible component of Del Mod to the teachers and since the field agents supplied rapid solutions to the classroom teacher problems, their activities were evaluated by teachers as the most important part of the Del Mod Program.

To gain the confidence that teachers held for the field agents, it was necessary for the field agents to demonstrate that they had no vested interests in the Department of Public Instruction, institutions of higher learning, or public school administrations. The field agents were there to help teachers

and not to evaluate them. The trust thus generated allowed a rapport between field agents and teachers to exist that enabled honest problem solving in the classroom to take place. One teacher described the field agents as "doers at the grassroot level."

Since the field agent program has been instituted, the agents have worked with 89 schools while conducting 127 workshops, participating in 20 curriculum projects, directing 15 courses, developing an outdoor classroom, and implementing and individualized instruction program.

The field agents have maintained a high professional level of competence. The agents belong collectively to 13 local, 8 state, and 2 regional professional committees. They have produced numerous publications and a periodic newsletter for the teachers of Delaware. They have presented papers at six local, six regional, and three national conventions.

Perhaps the most important attribute of the field agents was the teacher confidence they created. They not only provided materials, but psychological support as well. They were viewed by teachers as a supportive friend.

Science-Math Resource Centers Success of elementary and secondary school science and math programs are often dependent on a teacher's ability to provide a variety of learning environments. The adequate amount of learning vehicles are not available to most schools, either because the teachers and administrators do not know about them or the budget of the school does not permit purchase of such items. The Del Mod System established the science-math resource centers to provide both preservice and inservice teaching devices, models, and texts.

Specifically, the resource centers allowed teachers to borrow or to examine materials and equipment, textbooks, films and other audio-visual equipment. Science supervisors, teachers, science groups, or preservice teachers could use the centers as a focus for program development projects. The field agents could use the equipment of the center for demonstrational teaching or for teacher use, and use the center as an operational base.

Three centers were established in the Del Mod System. Although each was set up under the same guidelines, the location of each ultimately dictated different functions. Centers were located at the University of Delaware at Newark, Delaware State College at Dover, and Delaware Technical and Community College at Georgetown. Each center served inservice and preservice teachers, but to different degrees. The Georgetown Center served primarily inservice teachers and was consequently rated highest by teachers interviewed during the evaluation. The

University of Delaware and Delaware State College have science education programs for undergraduate students; consequently, the centers at Dover and Newark were used heavily by the preservice teachers. Inservice teachers had difficulty finding adequate parking facilities at the University of Delaware and consequently did not use the center as frequently as it was anticipated they would. The University of Delaware center, however, was useful to the inservice teachers through the services of the field agents. The center at Delaware State College was least useful to the inservice teachers since it lacked some materials found in the other centers and was apparently less well organized. The Dover Center librarian has duties outside the center which removed some of the service function found in the other two centers.

The evaluators involved with resource center evaluation all viewed them as a valuable asset to the Del Mod System. They also found the resource center idea would be transportable to their locales. The Georgetown Center model was the one most transportable. This center was not directly associated with a teacher training program and therefore gave its full commitment to inservice teachers. It also had a wide range and scope of materials. One evaluator suggested that the center would be most useful in the intermediate unit concept of Iowa and Michigan. Another evaluator believed the Georgetown model could be moved intact to a community college setting. Several evaluators indicated that construction of instructional materials was a useful and transportable item used by the centers. The field agents should be tied more directly to the centers. In the Del Mod System some field agents used the centers more effectively than others.

When selecting a site for a resource center the target population must be kept in mind. It was fortunate that the Del Mod System had an opportunity to set up a center in primarily a graduate student, preservice teacher setting (Newark), an inservice teacher setting (Georgetown), and a preservice setting (Dover). Most evaluators favored the inservice-teacher-only center model and would, therefore, like the center established in a 2-year college or intermediate unit setting. The use of senior citizens was viewed by some evaluators as an effective use of funds and an idea that would be transportable to their areas. The center should be large enough to require the use of a full-time librarian.

The flexibility component of the Georgetown center is an important attribute. The center must be able to meet a teacher's needs immediately in order to be highly effective. This includes workshops and inservice programs requested by teachers.

Where initial funds for a resource center are limited, a director could collect a variety of materials from several schools

and then consolidate the material into a small center. The center could be made larger as more funds became available.

The newsletter published by the Georgetown Center is a transportable item as viewed by most evaluators.

Although most evaluators believe the resource centers are most effectively used for inservice teachers, there is little question that the centers were valuable to preservice teachers as well. It is quite possible that centers such as the ones at Dover and Newark could be set up equally well in other 4-year colleges and universities.

The Equipment Repair Center The Equipment Repair Center was unheralded, but viewed as an important asset to the Del Mod System. This "behind the scene" operation provided schools with equipment repair service for microscopes and other scientific equipment on a parts cost basis. The repair work was done by students in the Technical College. A service was not only provided for teachers, but for the Technical School students as well. The repair service is unique and is transportable to the degree that similar technical schools are found throughout the United States. It appears that they would welcome materials suitable for student use in a technical school program. One evaluator recommends that adequate funding ($25,000) should be made available to make transportability feasible.

Del Mod Evaluation Staff The philosophy of Del Mod was to place a high percentage of the funding for the program directly into the schools through the various service components available for school use. As a result of this philosophy, the non-service component of evaluation was not funded as well as is true for most NSF sponsored programs. The five percent of the funding allocated to evaluation was, in retrospect, inadequate.

In spite of the program directional changes due to key personnel changes during the five year history of Del Mod, and goal modifications necessary due to pragmatic policy changes, an evaluation program was conducted by the evaluation staff.

Formative evaluation was conducted through the research of science education doctoral students from Temple University and Lehigh University, and through annual summary reports submitted by Del Mod each year to NSF.

Summative evaluation has been conducted by the evaluation staff for the past year on the various components of Del Mod. In addition, the Responsive Evaluation adaptation originally developed by Robert Stake (see appendix A) was used to measure the effectiveness of the several components of Del Mod.

Global Summary of the Del Mod System The reports by the panel of evaluators were highly favorable to the Del Mod System. The administrative component of Del Mod was effective in the Delaware setting. Evaluators generally felt that the administrative component would not be transportable since the structure in different locales vary sufficiently to require a unique administrative model for each locale.

The field agent component was the most valuable part of the Del Mod System. As a major goal of Del Mod, the money from the project should end up in the schools of Delaware in the form of improved science and math teaching. The field agents made this possible. Generally the field agent was regarded as a well qualified expert in science or math that posed no threat to the security of the teacher and who not only helped, but befriended the teachers. The field agent component was the most transportable to other parts of the United States.

The Science-Math Resource Centers were also viewed as an integral and important part of the Del Mod System. There was some disagreement as to whether the field agents could operate effectively without the resource centers, but all evaluators viewed the resource center model as transportable to other parts of the United States.

The Equipment Repair Center is valuable not only to the teachers using the service, but to the technical students doing the repair work. This component is transportable as long as properly located technical colleges are available.

Some evaluators felt uncomfortable using the Responsive Evaluation technique as the vehicle to evaluate Del Mod. It is interesting that in spite of the concerns of some, there was a great deal of consensus among evaluators about both the positive and the negative aspects of the Del Mod System. Particularly strong agreement was registered by evaluators on the effectiveness of the field agents and of the resource centers.

The evaluators generally agreed that teachers using the services provided by Del Mod had become dependent upon them. If the apparent improvements are to continue, and if present levels of science and math teaching in Delaware are to be maintained, the program of field agents and probably of resource centers must continue. Although the funding required for continuation of the Del Mod Project would be high, the budget would be significantly lower than the initial operational costs. The upgrading of each resource center annually would be nominal when compared to the salaries paid to the field agents and resource center librarians.

Summary Observations on the Del Mod System

The following observations, which are reflections on five years of close involvement with the Del Mod System, include comments on (1) evaluation procedures, (2) field agents and resource centers, (3) federal subsidies for State-wide collaboration and (4) the context of schooling, 1970-76.

Evaluation Procedures

1. In retrospect, the basic evaluation design of the original Del Mod proposal was naive. Emphasis given to measurements of the status of science education in Delaware prior to and after five years of the Del Mod System is a grossly deficient evaluation design to answer the question, "Did the Del Mod System improve science and mathematics education in Delaware?" Even had such measurements been adequately taken and "improvements" noted in a variety of status variables, there would have been so many alternative explanations possible that no conclusions about the efficacy of the Del Mod System could have been drawn. Likewise, in the absence of strong evidence of improvement in status variables, it cannot be said that the Del Mod System was ineffective. A tremendous number of changes from 1970-76 occurred, in the world situation, in American culture, in federal policy toward education, in the state of Delaware, that were obviously operating

on the same status variables. For example, scholastic aptitude and achievement scores declined during this period, nationally, and in Delaware.

2. The purposes of evaluation were unclear and changed over the life of the project. At first, the National Science Foundation seemed to emphasize the development of a delivery system that would coordinate teacher training activities in the state and would relate these activities to the needs of teachers. Later, with the Stufflebeam evaluation, Foundation officers posed questions about the generality and transportability of the system and its elements. Even later, Foundation officers appeared to lose interest in the Del Mod evaluation altogether as a controversy arose nationally about curriculum implementation activities of the Foundation and as the project entered its final years. In a similar way purposes of internal evaluation changed. Initially, emphasis was almost total upon the development of service programs worth evaluating. Then, decisions about the "phase in" of various Del Mod programs needed to be made, and priorities of the individual institutions took precedence over the modest evaluation data available. It became clear that the Del Mod System was a luxury the state would be unable to afford.

3. The complexity of the Del Mod System as an educational

intervention strategy was clearly beyond the evaluation technology available. Encompassing as it did all public schools in Delaware, all institutions of higher education and the Department of Public Instruction, and given that the project evolved over a number of years, the resources devoted to evaluation could just barely manage to keep a running description of Del Mod activities. External observers of the system commented on the difficulty of grasping the Del Mod System as a whole, finding time only to observe isolated portions of the system. Even participants saw only limited aspects of the total system. Many times activities developed or affected by the Del Mod System were not viewed as Del Mod activities by participants. For example, activities of the Department of Public Instruction or University were often viewed as just that, not Del Mod inspired. This difficulty affected not only the original evaluation design, but also the Stufflebeam and later evaluation efforts.

4. A particular problem of evaluation within the Del Mod System was the predominant service orientation of the project. In many ways evaluation appeared to conflict with this service orientation. For example, Foundation officers asked that additional funds be allocated from within the project to strengthen evaluation. To do so would take away from services provided to schools and teachers. This conflict in priorities existed at every

level of decision making within the system from the Director's Office, in the allocation of funds and positions, down to the field agent or individual teacher, who believed that time spent writing evaluation reports was time taken from direct educational service. An even more important problem to internal evaluation was the philosophy of service exemplified in the field agent program. A major premise of the field agent program was that non-evaluative relationships were the keystone of field agent success in effecting change. Thus, evaluation in any form could be a threat to the strategy being evaluated. This "catch-22" was not well understood by outside evaluators.

5. As noted by project staff, Foundation officers and several evaluators, the Del Mod System was not an "engineering" system. Each participating institution yielded very little institutional autonomy. Instead, The Del Mod System was an agreement to cooperate in achieving mutual goals. The management of the Del Mod System was, in large measure, a political activity, involving state-wide as well as local politics of education. Some of these key political factors do not surface in evaluations and, in fact, were hidden, because their publication might have destroyed the system itself. Also, it is difficult for outside

observers to understand educational politics in a given state such as Delaware and to weigh the effectiveness of a system like Del Mod in working with these political realities.

6. Evaluation of the Del Mod System exemplifies a common weakness of educational evaluation strategies in neglecting to weigh the costs in relationship to possible benefits. Nowhere in the published evaluation documents is an adequate analysis made of the costs of various aspects of the system in terms of some reasonable unit of output. Especially, no effort was made to weigh the costs of "benefits forgone", that is, other things for which the money could have been spent. For example, in 1972-73, over $700,000 was allocated to Del Mod activities. In the same year the total budget of the College of Education at the University of Delaware was just over $1,000,000. Thus, one might ask about the relative merit of increasing the faculty of the College of Education by 70% as an alternative to the Del Mod System. The same type of question might be asked about direct aid to local districts, to the Department of Public Instruction or other agencies.

7. Because of technical and resource problems in evaluating complex educational interventions such as the Del Mod

System, it is apparent that evaluation rests upon the opinions of participants and "connoisseurs". Unfortunately, even in this area, evaluation efforts were flawed by technical problems. On the other hand, the Del Mod System was fortunate to have two independent assessments of such opinions which came to general agreement about the merits of the Del Mod System and its component activities.

Field Agents and Resource Centers

1. The concept of regional curriculum resource centers and educational field agents, which were envisioned as a central feature of the Del Mod System, proved meritorious as long as special funds were provided. However, as special funding ended, so did the field agent program. Resource centers persisted in relation to other programs at each institution, especially undergraduate and graduate programs for educational personnel.

2. The roles played by field agents were perceived as important additions to the mechanisms for instructional supervision, curriculum improvement, and teacher education. The fact that field agents were perceived by school personnel as "neutral", that is, not representing school management, state regulative authority, or graduate schools was an important factor in

the success of the field agents. This is an important validation of the concepts in many teacher centers, where emphasis is given to shared governance, mutual assistance from peers and non-evaluative support services to teachers.

3. Validation is also provided from the field agent program for the conclusion that linkage among elements in the educational system is an essential ingredient in school improvement. The record of the field agent program documents over and over the difficulty of finding links between teacher needs, institutional goals, (at the local, state, national levels) and training resources. In retrospect, without Del Mod, the educational system in Delaware appears to be sadly lacking in resources devoted to establishing and maintaining such linkage.

4. The idea of a regional curriculum resource center designed to assist in-service teachers is a useful component in a system to stimulate curriculum improvement. It is clear, however, that this is a special function, not necessarily consistent with curriculum resource centers to serve undergraduate and graduate programs for training educational personnel. Special steps, such as those taken at the Georgetown Resource Center, are probably needed to attract in-service teachers and to meet their particular needs.

5. Considering the positive reception, the fact that the field agent program did not persist beyond federal funding is an interesting puzzle. In retrospect, it appears that the field agent program was a supplement to existing components of the educational system, each of which persisted instead of being replaced by field agents. For example, decisions to replace existing positions in the Department of Public Instruction or in the University of Delaware with field agent positions were considered, but never made. In each case, functions of existing positions held higher priority. No coalitions of institutions or individuals developed to seek a share of the educational dollar for continuing the field agent program as a separate institution. A difficult problem in evaluating these facts is that the state, and each of its educational institutions, were entering periods of stability or decline. Thus, supervisor positions in local districts, faculty positions in the College of Education, and variety of positions in the DPI all declined during these years. Field agents became a luxury which the state and its agencies could not afford.

6. In spite of the failure of the field agent program, as a recognized entity, to persist, elements of the field agent strategy and the program do continue. Possibly the most important residual from the Del Mod project is the view,

widely shared among Delaware educators, that the educational field agent and regional resource center, are part of a successful strategy for dealing with educational problems. For example, plans for court-ordered desegregation of New Castle County's schools included a similar strategy. Field agents and resource centers have operated in other curriculum areas, such as reading and economic education. A special master's degree program for in-service teachers was developed at the University of Delaware following the field agent program philosophy. Thus, the Del Mod project became a vehicle through which Delaware educators worked on the problems of collaboration and articulation, becoming aware of the prospects as well as the problems.

7. External observers were persuaded that the field agent and resource center concepts could be readily adapted to a variety of settings, given appropriate funding. The Del Mod System developed an important body of practical wisdom, which could assist others in establishing similar programs.

8. Unfortunately, hard evidence about the impact of the field agent program on the behavior of Delaware teachers and pupils is missing. Thus, one is left wondering about the value of the field agent program in terms of curriculum change and student learning. One can imagine a variety of

positive comments, such as those obtained in a variety of Del Mod evaluations, without substantial changes in teaching and learning.

Federal Subsidies for Statewide Collaboration in Education

1. A central aspect of the Del Mod project was the substantial federal subsidy granted for statewide collaboration in teacher education. From this point of view, higher levels of cooperation were purchased from the major industrial firm, the institutions of higher education, and the public school system for securing improvements in science and mathematics education. As in other Systems and Comprehensive Projects, the National Science Foundation sought to improve upon its previous grant strategy, which funded major curriculum development projects and also a variety of independent teacher institutes. The goal of this new strategy was improved coordination among training activities and between training activities and the goals of public schools.

2. It is clear that such cooperation and articulation did occur, at least during the period of funding. It is less clear that such statewide collaboration will persist. For example, it is clear in retrospect that the NSF funds for Del Mod purchased a monthly meeting of the presidents of the institutions of higher education with the State Superintendent of Public Instruc-

tion on the subject of educational improvement in science and mathematics. Similar meetings across institutional lines were held in abundance during the Del Mod funding period. Without doubt, changes in the activities within each institution were affected by the cooperative arrangement. At the very least, the time and energy allocated within the state to science education was affected, producing increased awareness and communication among components.

3. The record of Del Mod projects provides ample evidence that a host of training activities was conducted in Delaware with a close relationship between training objectives and the needs of Delaware teachers and schools. It is safe to say that many of these activities would not have been conducted without the special Del Mod funds. However, it is less easy to say that, dollar for dollar, more cooperation or connection with local school goals was obtained through the Del Mod System than would have been obtained through a continuation of the previous strategy. As a personal opinion of one involved, it appears that the cost of the statewide system was high and that less expensive solutions could be found to produce cooperation and coordination.

4. A principal assumption of the Del Mod System was that

federal subsidies to establish a statewide system for improving science and mathematic education might result in a permanent enterprise funded by state and local sources. Although this "seed money" strategy for federal funding has been questioned many times, nevertheless, it continues as a common assumption. In the case of the Del Mod System, no revolutionary changes occurred in the system of elementary and secondary education in Delaware. Institutional roles, functions and territories remain intact. If anything, the shortage of educational funds within the state means that there is increased competition among educational institutions. In retrospect, state politics of education appear to work against the establishment of state or local resources for a cooperative system such as Del Mod.

Context of Schooling, 1970-76

1. An interesting aspect of the Del Mod System was the rapidly changing social, political, and economic context of elementary and secondary schooling during the life of the system, 1970-76. The effects of these changes on the Del Mod System illustrate the importance of outside factors on the operation of a system for statewide curriculum improvement. Briefly, it may be recalled that during the life of the Del Mod System growth in pupil enrollments ended and a surplus of

school personnel began. Major political and economic events included the end of the Vietnam War, and a world-wide energy and food crisis.

2. During this period there was a conservative swing in opinions about the possibilities of social progress and especially about the role of public education in bringing such progress about. Watergate occurred to symbolize growing skepticism about the integrity of public institutions. Continuing problems of discrimination, poverty, crime, and polution brought disillusionment with social programs begun during the 1960's.

3. In particular, federal involvement in programs to improve elementary and secondary schools changed. Emphasis was shifted to career education and to reductions in federal spending. Results of federal efforts to reform education were disappointing and optimism about the possibility of change in education declined. At the end of the Del Mod project, emphasis had shifted from science as an inquiry process to concern for achieving minimum competencies in basic skills.

4. Specifically, officers and program priorities of the National Science Foundation changed dramatically during the course of the Del Mod System. Del Mod System was conceived as part of a broad and extensive effort to

develop comprehensive systems of curriculum change. Plans for such a program were drastically curtailed, such that no additional statewide systems, other than Delaware and Oregon, were funded, and so-called "comprehensive" projects were either terminated early or changed into "implementation" projects. Concepts underlying the Del Mod System became less popular in the Foundation, and a national flap occurred in connection with an NSF-sponsored curriculum implementation effort. It was widely charged that the Foundation was supporting the use of questionable subject matter in local schools through its curriculum implementation efforts. Thus, curriculum implementation became a sensitive subject in the later stages of Del Mod.

5. Similar changes occurred in educational policy and decision making within the state of Delaware. For example, the Governor, who was personally involved in the establishment of the Del Mod System, was not re-elected. A new person assumed responsibilities for the Committee on Educational Aid within the DuPont Company. A new Dean of Education and Academic Vice President were appointed at the University of Delaware. These, and many other changes, had important effects on the Del Mod System. It is remarkable in the light of such changes that the Del Mod System remained alive at all.

6. A particular problem within Delaware for the Del Mod System was the worsening financial condition of the state government, which affected all educational agencies. Thus, escalating costs of education, combined with limited state revenues, put all educational institutions in tough financial straits. The State of Delaware had a major financial catastrophy in the failure of the Farmers Bank of Delaware, and the schools of New Castle County became almost totally absorbed in a metropolitan desegregation order. Economy moves within the educational system made early plans for phasing-in the Del Mod System impossible. Where major educational institutions within the state could collaborate to gain additional federal funds, they were in direct competition for the limited number of educational dollars available from the state government. Each was cutting back personnel and programs to absorb inflating costs.

7. Finally, it appeared that an increased emphasis was being given to local control in educational matters during this period. Nationally, and within Delaware, suspicion grew about the desirability of large scale educational improvement efforts at the national or even the state level. Despite federal court orders to desegregate and to equalize school finance at the

state level, there was growing awareness during this period that the local school site remains the fundamental unit for educational improvement. Thus, interest in elaborate statewide schemes was declining, and new interest was being shown in local efforts of school improvement.